

California High-Speed Train Project



Agreement No.: HSR 13-06

Special Specifications

| Revision No. | Date | Description |
|--------------|--------------|---------------------|
| 0 | 01 Mar 12 | Initial Release, R0 |
| 1 | 12 July 2013 | EXECUTION VERSION |
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CALIFORNIA HIGH-SPEED TRAIN PROJECT – SPECIAL SPECIFICATIONS
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SECTION 02 01 11.23

RECONFIGURATION OF STANISLAUS AND TUOLUMNE STREETS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Reconfiguration of Stanislaus Street, Tuolumne Street, and cross streets.

1.2 WORK INDICATED ELSEWHERE IN THE CONTRACT DOCUMENTS

- A. As part of the Work, the existing overcrossings of Stanislaus and Tuolumne Streets over the UPRR shall be removed. The Contract Package drawings show the following:
1. Stanislaus Street overcrossing will be replaced with a 4-lane two-way overcrossing of HST, UPRR, G Street and H Street. The reconstruction of Stanislaus St is from E St to Broadway.
 2. Tuolumne Street overcrossing will be removed and will not be replaced. Tuolumne Street will be reconstructed as an at-grade two-way street between F St and G St and between H St and Broadway.
 3. Tuolumne Street will be reconstructed as an at-grade two-way street between F St and G St (terminated at G St) and between H St and Broadway (terminated at H St).

1.3 RECONFIGURATION OF STANISLAUS AND TUOLUMNE STREETS

- A. The existing configuration of Stanislaus Street and Tuolumne Street shall be changed in accordance with the requirements of the City of Fresno as summarized herein. The streets currently operate as 2-lane one-way pairs. Stanislaus Street currently is west bound from downtown toward SR 99, Tuolumne is eastbound from SR 99 toward downtown. Both of these streets have grade separated crossings of the UPRR, G Street and H Street.
- B. The reconfiguration of these streets and their cross streets shall extend beyond what is depicted in the Contract Package drawings. The reconfiguration shall be completed per the attached City of Fresno diagram, City of Fresno requirements including those referenced in this Section, and the Contractor's Construction Drawings which shall be prepared showing detailed design of the area shown on the diagram. The diagram indicates converting Stanislaus Street to two-way operation from A Street to P Street and converting Tuolumne Street to two-way operation from F Street to G Street and from H Street to Van Ness Ave.
1. Refer to Attachment 02 01 11.23 (City of Fresno Diagram) which shows aerial photographs of Stanislaus and Tuolumne Streets from "A Street" to the BNSF Railway. The aerial photographs are marked up to show lane and street directions, turn lanes, and roundabouts as they shall be configured upon the completion of the Work of this Section.
- C. It is assumed that all work will be within the existing City of Fresno right of way.
- D. The reconfiguration shall include all work required to complete the reconfiguration in accordance with City requirements. Work shall include meetings with the City of Fresno regarding its specific requirements; preparing detailed design; obtaining City approvals of Construction Drawings and temporary traffic control plans; performing temporary traffic control; localized

RECONFIGURATION OF STANISLAUS AND TUOLUMNE STREETS

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resurfacing as required; removal of existing and installation of new striping, marking, and markers; modifications to and additions to traffic signal system; removal of existing and installation of new signage; demolition of existing and construction of new wheelchair access ramps and curbs as necessitated by new configuration; and other work.

1.4 SUBMITTALS

- A. Submit design approved by the City of Fresno and related permits for information.
- B. Submit Construction Drawings as required under the Scope of Work.

PART 2 - PRODUCTS**2.1 MATERIALS**

- A. Materials shall comply with City of Fresno Standard Specifications.

2.2 DESIGN CRITERIA

- A. Comply with City of Fresno Standard Plans and Specifications and other requirements.

PART 3 - EXECUTION**3.1 GENERAL**

- A. Comply with Construction Documents approved by the City of Fresno.

END OF SECTION

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RECONFIGURATION OF STANISLAUS AND TUOLUMNE STREETS

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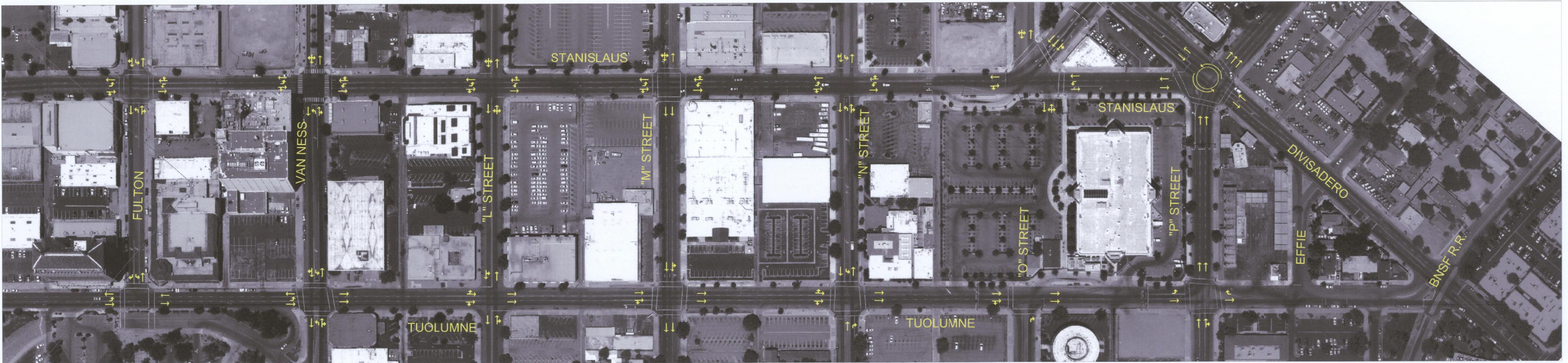
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STANISLAUS STREET AND TUOLUMNE STREET FROM "A" STREET TO BROADWAY



STANISLAUS STREET AND TUOLUMNE STREET FROM BROADWAY TO THE BNSF RAILROAD

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CALIFORNIA HIGH-SPEED TRAIN PROJECT – SPECIAL SPECIFICATIONS**Agreement No: HSR13-06****SECTION 02 01 35.63****CALTRANS-IMPACTED FACILITIES****PART 1 - GENERAL****1.1 WORK**

- A. For all Caltrans-impacted Work in this Contract, the Caltrans Standard Specifications, Standard Special Provisions (SSPs) and Standard Plans shall apply to the Caltrans Work, except as modified below.
- B. The Contractor shall prepare the following contract-specific documents for submittal to and approval by Caltrans and the Authority. Contractor shall incorporate the modifications to the Caltrans Standard Specifications and Standard Special Provisions below, into the Contractor-prepared contract-specific documents.
 - 1. Caltrans Standard Special Provisions (SSPs).
 - 2. Non-Standard Special Provisions (NSSPs).
- C. The Work of this Section is based on the 2006 Caltrans Standard Specifications. Applicable edition of the Caltrans documents for purposes of the Contractor's design shall be as documented in the agreement between Caltrans and the Authority.

1.2 MODIFICATIONS TO CALTRANS STANDARD SPECIFICATIONS AND STANDARD SPECIAL PROVISIONS

- A. Caltrans Standard Specifications and Standard Special Provisions shall be understood to be modified as follows:
- B. Contractor shall comply with all provisions of the agreement between Caltrans and the Authority for the Caltrans-impacted Work of the Contract Documents.
- C. Sections 1 through 7, 9 and 11 of the Caltrans Standard Specifications generally will not apply to the Work of this Contract, except as noted below. Refer to the Instructions to Proposers, General Provisions, Special Provisions and other Contract requirements.
 - 1. Section 1, Definitions and Terms: Definitions apply as stated except as follows:
 - a. Acceptance: Acceptance will be by the Authority, except as defined otherwise in the agreement between Caltrans and the Authority.
 - b. Bidder shall be understood to be the Proposer.
 - c. Caltrans, Department, Department of Transportation and District shall be understood to mean the Authority, except as defined otherwise in the agreement between the Caltrans and the Authority.
 - d. Contractor shall mean the Contractor.
 - e. Director: Director shall be understood to mean the Authority.
 - f. Engineer shall be understood to mean the Contracting Officer, except as defined otherwise in the agreement between Caltrans and the Authority.
 - g. Engineer's Estimate: Engineer's Estimate does not apply to this Contract.
 - h. Liquidated Damages: Refer to the Special Provisions of these Contract Documents.

CALTRANS-IMPACTED FACILITIES

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- i. Proposal, Proposal Form, Proposal Guaranty: Refer to the Instructions to Proposers in these Contract Documents
 - j. State: “State” shall be as defined in the Caltrans Standard Specifications Section 1, except that “the Department” shall generally be understood to mean the Authority.
 - k. State Contract Act: Refer to the General Provisions of these Contract Documents.
2. Section 7, Legal Relations and Responsibility: The following Articles apply to this Contract:
- a. Articles 7-1.01D through 7-1.02, 7-1.04 through 7-1.11, and 7-1.13 through 7-1.22.
- D. Contractor shall coordinate the requirements for the Work of the Caltrans-impacted facilities with the requirements of the other non-Caltrans Work of this Contract, including the High-Speed rail corridor, other City of Fresno and County of Fresno Work requirements. As an example, the Caltrans requirements for disposal of material outside the highway right of way shall be coordinated and comply with the requirements for disposal of material for the other portions of the Contract Work, and shall not adversely impact the other Work.
- E. Caltrans Standard Specifications and Standard Special Provisions which address commercial terms and administration of the Contract will not be applicable. Refer to the agreement between Caltrans and the Authority. Disregard any references in the Caltrans Standard Specifications and SSPs related to pay items or quantities, measurement for payment, method of measurement, basis of payment, extra work, adjustment of unit prices, “partial payments” or similar phrases.
- F. References to “extra work,” “compensation for,” “at the Department’s expense,” “quantity adjustments,” “equivalent quantities,” “sharing of costs” or similar phrases, shall be disregarded. It is intended that the payment of the Contract Price will be full compensation for all Work performed pursuant to the Contract unless specific provisions for additional payments are contained in the Contract Documents.
- G. References to Beginning of Work, Time of Completion, Liquidated damages or similar phrases shall be disregarded. Refer to the General Provisions of these Contract Documents for these items.
- H. References to “as directed by the Engineer”, “as ordered by the Engineer” or similar phrases shall be revised to “as required by the Contracting Officer”.
- I. The specific roles for Caltrans representatives, such as QA Inspector, will be in accordance with the agreement between Caltrans and the Authority.
- J. All submittals, including design, procurement and construction-related submittals shall be submitted to the Contracting Officer and/or Caltrans as required in the agreement between Caltrans and the Authority. Refer to the Scope of Work for submittal requirements regarding number of submittals and review periods.
- K. Partnering, if applicable, will be per the Special Provisions of these Contract Documents.
- L. Refer to the agreement between Caltrans and the Authority regarding State-furnished materials and equipment.
- M. Wherever Contractor’s design indicates items such as signs and electrical equipment, etc. be removed, the Contractor shall indicate the disposition of each item in a manner accepted by Caltrans. The Contractor shall indicate one of the options below, for Caltrans review and

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acceptance: In such cases that a new item is required to be provided due to Caltrans decision not to allow re-installation of an existing item or any other decision by Caltrans in regard to removed items, additional compensation will not be granted

1. Reinstall as part of the Work at a specific location;
 2. Salvage and deliver to a storage facility designated by Caltrans; or
 3. Remove item and dispose of it off the Work site.
- N. The Contractor shall be responsible for determining the notifications required and turn-around time for responses acceptable to the Contracting Officer and/or Caltrans. The Contractor shall schedule the Work according to these requirements. Additional compensation or Contract time extensions will not be granted due to notification requirements and response periods.
- O. Refer to the agreement between Caltrans and the Authority regarding Construction Project Information sign requirements.
- P. For additional requirements for existing utilities, see the Scope of Work, Attachment 5, for Support and Protection of Utilities and Relocation of Existing Utilities.
- Q. Refer to the Contract Documents for storm water pollution prevention requirements. Coordinate with Caltrans for compliance with these requirements and Caltrans requirements.
- R. Refer to the Scope of Work for Temporary Traffic Controls for additional traffic control requirements.
- S. Contractor will be responsible for damages due to late reopening of roadway closures. Damages will be calculated by Caltrans for the Authority. Refer to the agreement between Caltrans and the Authority. The Authority will assess the Contractor for such damages.
- T. Contractor will be responsible for penalties under Caltrans Standard Specifications Section 9-1.07E(3) "Performance Failure Withholds". Penalties will be calculated by Caltrans for the Authority. Refer to the agreement between Caltrans and the Authority. The Authority will assess the Contractor for such penalties.
- U. No additional payment will be made for replacement and repair of damaged unmarked below ground irrigation facilities. Contractor shall include costs for these unknown conditions in the Contract price.
- V. "Special Days" as in Caltrans' "Legal Holidays and Special Days" are as follows:
1. Martin Luther King Jr. Day and Easter Sunday
- W. All Work within the Union Pacific Railroad right of way shall also comply with the following:
1. Technical Specifications for Construction of Industrial Tracks
 2. Guidelines for Temporary Shoring
 3. Joint BNSF Railway and UPRR Guidelines for Railroad Grade Separation Project

PART 2 - PRODUCTS

Not Used

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PART 3 - EXECUTION

Not Used

END OF SECTION

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CALIFORNIA HIGH-SPEED TRAIN PROJECT – SPECIAL SPECIFICATIONS**Agreement No: HSR13-06****SECTION 02 01 35.66****CITY OF FRESNO-IMPACTED FACILITIES****PART 1 - GENERAL****1.1 WORK**

- A. For all City of Fresno-impacted Work in this Contract, the City of Fresno Standard Specifications and Standard Drawings shall apply to the City of Fresno Work, except as modified below.
- B. The Contractor shall prepare the following contract-specific documents for submittal to and approval by the City of Fresno and the Authority.
 - 1. City of Fresno Special Specifications

1.2 MODIFICATIONS TO CITY OF FRESNO STANDARD SPECIFICATIONS

- A. Contractor shall comply with all provisions of the agreement between the City of Fresno and the Authority for the City of Fresno-impacted Work of the Contract Documents.
- B. Section 1 – Terms, Definitions, is modified as follows below. Refer to the Instructions to Proposers, General Provisions, Special Provisions and other Contract requirements.
 - 1. Bidding Requirements: Refer to the Instructions to Proposers of the Contract Documents.
 - 2. City, City of Fresno shall generally be understood to mean the Authority, except as defined otherwise in the agreement between the City of Fresno and the Authority and as follows:
 - a. Where indicated as “installed by City/City of Fresno”, “City/City of Fresno easements”, “operated by City/City of Fresno”, “City/City of Fresno standards, standard plans or standard specifications”, “City/City of Fresno Fire Department”, “City of Fresno Water Division”, “City Corporate Yard”, or similar phrases, City or City of Fresno will generally mean the City of Fresno.
 - 3. Council shall be understood to mean the Authority.
 - 4. Director: Director shall be understood to mean the Authority.
 - 5. Engineer shall generally be understood to mean the Contracting Officer, except as defined otherwise in the agreement between the City of Fresno and the Authority.
 - 6. Major Bid Item does not apply to this Contract.
 - 7. Proposal: Refer to the Instructions to Proposers of these Contract Documents.
- C. Section 2: The following articles do not apply to the Work of this Contract.
 - 1. Articles 2-1 through 2-5.2. Refer to the Instructions to Proposers, General Provisions, and Special Provisions of the Contract Documents for those requirements.
- D. Section 3 – Changes in Work, does not apply to the Work of this Contract. Refer to the General Provisions, Special Provisions and other Contract requirements.
- E. Section 6 – Prosecution, Progress and Acceptance of the Work: The following articles do not apply to the Work of this Contract.

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CITY OF FRESNO-IMPACTED FACILITIES

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1. Articles 6-4 through 6-8, and 6-10. Refer to the General Provisions and Special Provisions for those requirements.
- F. Section 7 – Responsibilities of the Contract in the Conduct of His Work: The following articles do not apply to the Work of this Contract:
1. Article 7-3: Refer to the General Provisions and Special Provisions for requirements for this Contract.
- G. Contractor shall coordinate the requirements for the Work of the City of Fresno-impacted facilities with the requirements of the other non-City of Fresno Work of this Contract, including the High-Speed rail corridor, Caltrans and County of Fresno Work requirements.
- H. Requirements for disposal of material outside the City right of way shall be coordinated and comply with the requirements for disposal of material for the other portions of the Work, and shall not adversely impact the other Work.
- I. City of Fresno Standard Specifications which address commercial terms and administration of the Contract will not be applicable. Refer to the agreement between City of Fresno and the Authority.” Disregard any references in the City of Fresno Standard Specifications related to bid items, contract unit price, pay items or quantities, measurement for payment, method of measurement, basis of payment, extra work, adjustment of unit prices, or similar phrases
- J. References to “extra work,” “compensation for,” “at the City’s expense,” “quantity adjustments,” “equivalent quantities,” “partial payments” or similar phrases, shall be disregarded. It is intended that the payment of the Contract Price will be full compensation for all Work performed pursuant to the Contract unless specific provisions for additional payments are contained in the Contract Documents.
- K. Contractor will be responsible for all reimbursements to the City of Fresno where indicated as “costs incurred by City... shall be borne by Contractor”.
- L. References to “reimbursement of Work by City”, or similar phrases, shall be borne by the Contractor at no additional costs to the Authority. It is intended that the payment of the Contract Price will be full compensation for all Work performed pursuant to the Contract unless specific provisions for additional payments are contained in the Contract Documents.
- M. References to Beginning of Work, Time of Completion, Liquidated damages or similar phrases shall be disregarded. Refer to the General Provisions and Special Provisions of the Contract Documents for these items.
- N. References to “as directed by the Engineer” or similar phrases shall be revised to “as required by the Contracting Officer”.
- O. The specific roles for City of Fresno representatives, such as for inspections, will be in accordance with the agreement between the City of Fresno and the Authority.
- P. Refer to the Scope of Work for submittal requirements regarding number of submittals and review periods.
- Q. Refer to the agreement between City of Fresno and the Authority regarding City-furnished materials and equipment.

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- R. Wherever Contractor's design indicates items such as signs and electrical equipment, etc. be removed, the Contractor shall indicate the disposition of each item in a manner accepted by the City of Fresno. The Contractor shall indicate one of the options below, for City of Fresno review and acceptance: In such cases that a new item is required to be provided due to City of Fresno decision not to allow re-installation of an existing item or any other decision by City of Fresno in regard to removed items, additional compensation will not be granted
1. Reinstall as part of the Work at a specific location;
 2. Salvage and deliver to a storage facility designated by City of Fresno; or
 3. Remove item and dispose of it off the Work site.
- S. The Contractor shall be responsible for determining the notifications required and turn-around time for responses. The Contractor shall schedule the Work according to these requirements. Additional compensation or Contract time extensions will not be granted due to notification requirements and response periods.
- T. For additional requirements for existing utilities, see the Scope of Work, Attachment 5, for Support and Protection of Utilities and Relocation of Existing Utilities.
- U. Refer to the Contract Documents for storm water pollution prevention requirements. Coordinate with City of Fresno for compliance with these requirements and any additional City requirements.
- V. Refer to the Scope of Work for Temporary Traffic Controls for additional traffic control requirements.
- W. No additional payment will be made for replacement and repair of damaged unmarked below ground irrigation facilities. Contractor shall include costs for these unknown conditions in the Contract price.
- X. All Work within the Union Pacific Railroad right of way shall also comply with the following:
1. Technical Specifications for Construction of Industrial Tracks
 2. Guidelines for Temporary Shoring
 3. Joint BNSF Railway and UPRR Guidelines for Railroad Grade Separation Projects.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION**CITY OF FRESNO-IMPACTED FACILITIES**

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SECTION 02 01 35.69
COUNTY OF FRESNO-IMPACTED FACILITIES

PART 1 - GENERAL

1.1 WORK

- A. For all County of Fresno-impacted Work in this Contract, the Caltrans Standard Specifications and Standard Plans shall apply to the County of Fresno Work, except as modified below.
- B. The Contractor shall prepare the following contract-specific documents for submittal to and approval by the County of Fresno. The County of Fresno bases their designs on the Caltrans Standard Specifications.
 - 1. County of Fresno Project Specifications.
- C. Applicable edition of the Caltrans documents for purposes of the Contractor's design shall be as documented in the agreement between the County of Fresno and the Authority.

1.2 MODIFICATIONS TO CALTRANS STANDARD SPECIFICATIONS

- A. Contractor shall comply with all provisions of the agreement between the County of Fresno and the Authority for the County of Fresno-impacted Work of the Contract Documents.
- B. Refer to Special Specifications, Caltrans-Impacted Facilities, for other modifications to the Caltrans Standard Specifications.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

Not Used

END OF SECTION

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SECTION 02 01 55.53

ACCESS TO LA TAPATIA

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Maintenance of access to parcels currently known as the location of La Tapatia (parcels APN 459-023-56, 459-023-57, and 459-023-59).
- B. Design and construction requirements for temporary and permanent access to APN 459-023-56, 459-023-57, and 459-023-59.

1.2 REFERENCE STANDARDS

- A. The work of this Section shall be in accordance with the following standards:
- B. City of Fresno:
 - 1. Standard Plans and Specifications.
- C. State of California Department of Transportation (Caltrans):
 - 1. Highway Design Manual

1.3 DESCRIPTION

- A. Refer to the General Provisions for related requirements including requirements under “Business and Residential Impact Mitigations” and “Notice Requirements”.
- B. The parcels at APN 459-023-56, 459-023-57, and 459-023-59, commonly known as La Tapatia, currently have an access driveway to East Belmont Street, approximately 400-feet east of North H Street. Driveway access to this business shall be provided during construction and after completion of the Work as specified herein.
- C. Driveway access shall:
 - 1. Maintain temporary access during all hours of La Tapatia business operations.
 - 2. Temporary closures shall be limited to two-15 minutes closures per hour unless the business owner approves, in writing, a longer duration.
- D. Contractor shall obtain approval of the design from the City of Fresno.
- E. Contractor shall be responsible for the design.

1.4 SUBMITTALS

- A. Submit design approved by the City of Fresno and related permits for information.

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ACCESS TO LA TAPATIA

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1.5 COORDINATION

- A. Coordinate the design with the City of Fresno and the business owner or owners.
- B. Coordinate temporary closures with the business owners or owners' representatives.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Driveway materials shall comply with City of Fresno Standard Specifications for Commercial driveways.

2.2 DESIGN CRITERIA

- A. The driveway shall be designed in accordance with City of Fresno Standard Plans and Specifications for Commercial driveways.
- B. Temporary access shall be a minimum of 12-feet wide and 15-feet clear vertically.
- C. Temporary and permanent access shall accommodate a tractor semi-trailer combination turning radius.
- D. Permanent access shall be a minimum of 14-feet wide and 15-feet clear vertically.
- E. Permanent access shall connect directly to North H Street.

PART 3 - EXECUTION

3.1 GENERAL

- A. Construct driveway in compliance with City of Fresno Standard Specifications and Standard Plans for Commercial driveways.

END OF SECTION

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SECTION 03 30 01

DESIGN AND CONSTRUCTION OF TRENCH STRUCTURES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Design requirements for the Trench Structure.
- B. Design requirements for the excavation.
- C. Construction requirements for the installation of the structure.
- D. Monitoring of the installation process.
- E. Construction requirements for completion of the structure.

1.2 RELATED SECTIONS

- A. Section 03 05 15, Portland Cement Concrete
- B. Section 03 11 00, Concrete Forming
- C. Section 03 11 15, Falsework
- D. Section 03 15 00, Concrete Accessories
- E. Section 03 15 13, Waterstops
- F. Section 03 20 00, Concrete Reinforcing
- G. Section 03 30 00, Cast-in-Place Concrete
- H. Section 03 35 00, Concrete Finishing
- I. Section 03 70 00, Mass Concrete
- J. Section 31 09 13, Geotechnical Instrumentation and Monitoring
- K. Section 31 50 13, Temporary Excavation Support and Protection

1.3 REFERENCE STANDARDS

- A. CHSTP Design Criteria
- B. AASHTO (LRFD) Design Code.
- C. BNSF and UPRR Guidelines for Temporary Shoring (2004)

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- D. UPRR Guidelines for Design and Construction of Shoring Adjacent to Active Railroad Tracks (2010)

1.4 SUBMITTALS:

- A. Concrete Reinforcement: Provide submittals for the permanent concrete Trench Structures in accordance with the requirements of Section 03 20 00, Concrete Reinforcing and Section 03 30 00, Cast-in-Place Concrete.

1.5 DESIGN

- A. Refer to CHSTP Design Criteria for design requirements for the work of this Section including: Design life, loading conditions, stability requirements, and other design criteria.

1.6 CRITERIA

- A. Design the Trench Structure in accordance with the CHSTP Design Criteria. The structure design shall consider the loadings described in the CHSTP Design Criteria with particular attention to the following specific loadings:
1. Within 200 feet of the detention basin at Belmont, a groundwater level at 10-feet below ground level or as recommended by the Geotechnical Data Report..
 2. Allowance for forces locked into the permanent structure from the release of temporary propping in the shoring walls. Forces to be calculated by the Contractor as part of the temporary works design.
 3. Where the Dry Creek Canal crosses the covered trench, the roof slab shall be designed for a uniform surcharge equivalent to the weight of the culvert structure including the water it contains, assuming a water surface level at the 100 year flood level.
 4. Where ground water level is high, the design shall demonstrate a factor of safety against buoyancy for the permanent structure of 1.05 and 1.1 in flood conditions, as defined in the CHSTP Design Criteria. The calculation shall ignore any beneficial effect from shoring walls.
- B. Design Dry Creek Canal culvert for the following loadings:
1. As an earth retaining structure and as a structure for the conveyance of water.
 2. Over the top slab in general, live loading from maintenance vehicles.
 3. Over the section supporting the SJVR, railway loading (Cooper E80).
- C. The temporary works design shall consider:
1. The Contractors planned construction sequence;
 2. The timing location and stiffness of temporary propping in relation to the progress of excavation;
 3. The proximity of the Kinder Morgan hydrocarbon line to the excavation. The temporary works shall ensure that the pipeline is protected from the effects of movement during construction of the Trench Structure;
 4. Include a system of monitoring wall movements to demonstrate that the Kinder Morgan pipeline is not exposed to excessive movements;

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5. Sequencing any closures of SJVR spur tracks to ensure that there is always a useable connection from the SJVR to the UPR;
6. Coordinate the timing of road closures for construction of the overcrossing bridges with the City of Fresno.

D. Belmont Detention Basin

1. Where indicated on the drawings, the shoring walls between the Detention Basin and the Trench shall be designed as a permanent tangent pile structures in accordance with the CHSTP DesignCriteria.
2. The exposed face of the permanent shoring wall shall be treated with shotcrete as a final finish.

E. Dry Creek Canal

1. The structural design and support system of the Dry Creek Canal culvert shall be independent of the structure of the covered Trench Structure.
2. Ensure a minimum of 1 ft earth fill between the HST roof slab and the culvert.
3. Provision of a waterproofing membrane to protect the Trench Structure from leakage from the canal and possible flooding.
4. Coordinate the construction of the Trench Structure in the area of Dry Creek with the requirements of Fresno Irrigation District and Fresno Metropolitan Flood Control District to ensure adequate provision for dealing with flood events at all times.
5. Design a maintenance road crossing Dry Creek Canal culvert for FID use.

F. SR 180 undercrossing

1. Refer to Section 31 74 10 for criteria relating to Jacked Box Construction.

G. E Jensen Avenue Bridge

1. Design a system of temporary shoring to ensure that the foundations of the existing E Jensen Avenue bridge are protected from movement during the construction of the Jensen Trench.”

1.7 QUALITY ASSURANCE

- A. The engineer preparing drawings and design calculations for the shoring system shall be experienced in the design and construction of similar shoring systems.

PART 2 - PRODUCTS

- A. Not used.

PART 3 - EXECUTION

- A. Prepare specific proposals for construction in the area of Belmont basin for approval. As a minimum including:

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1. Methodology for dealing with water during excavation;
 2. Liaison, contact and communication channels between the Contractor and Fresno Metropolitan Flood Control District;
 3. Liaison, contact and communication channels between the Contractor and Fresno Irrigation District;
 4. Emergency action plans for dealing with flood events including events that may be instigated by FMFCD and FID;
 5. Liaison, contact and communication channels between the Contractor and Kinder Morgan.
- B. Prepare specific proposals for the diversion of the 96 inch Storm Drain outfall near Belmont basin and the 84 inch Storm Drain at E Church Ave for approval. As a minimum including:
1. Coordinate the design and construction of the utility diversion with the design of the Trench Structure and the temporary shoring systems.
 2. Program the works for diversion of the storm drain such that there is a functional Storm Drainage System at all times during the construction of the diversion.
 3. Liaison, contact and communication channels between the Contractor and Fresno Metropolitan Flood Control District.
 4. Emergency action plans for dealing with flood events including events that may be instigated by FMFCD and FID.
- C. Prepare specific proposals for the constrained area between Roeding Park and the UPR. As a minimum including:
1. Temporary construction easements will not be permitted within the Roeding Park Area
 2. Working within the constraints of the EIR/EIS document.

END OF SECTION

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SECTION 31 32 36

SOIL NAIL WALLS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Permanent soil nail retaining walls.

1.2 RELATED SECTIONS

- A. Section 31 39 13, Ground Anchors.
 B. Section 31 23 26, Aggregate Drainage Layer.
 C. Section 31 09 13, Geotechnical Instrumentation and Monitoring.
 D. Section 33 05 25, Support and Protection of Utilities.
 E. Section 02 22 00, Existing Conditions Assessment.

1.3 REFERENCES

- A. This work shall comply with the following Federal Highway Administration specification and design guidelines
1. FHWA SA 96-069R Manual for the Design and Construction Monitoring of Soil Nail Walls.
 2. FHWA 0-IF-03-017 Geotechnical Engineering Circular No. 7 – Soil Nail Walls

1.4 REFERENCE STANDARDS

- A. American Association of State Highway and Transportation Officials (AASHTO)
1. AASHTO T 106 Standard Method of Test for Compressive Strength of Hydraulic Cement Mortar
 2. AASHTO M 85 Specification for Portland Cement
 3. AASHTO M 171 Standard Specification for Sheet Materials for Curing Concrete
 4. AASHTO M 31 Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
 5. AASHTO M 284 Standard Specification for Epoxy-Coated Reinforcing Bars: Materials and Coating Requirements
 6. AASHTO M 252 Standard Specification for Corrugated Polyethylene Drainage Pipe
 7. AASHTO T260 Standard Method of Test for Sampling and Testing for Chloride Ion in Concrete and Concrete Raw Materials
- B. ASTM International (ASTM):
1. ASTM C33 Specification for Concrete Aggregates

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- 2. ASTM A722 Specification for Uncoated High-Strength Steel Bars for Prestressing Concrete
 - 3. ASTM D1784 Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds
 - 4. ASTM D1621 Standard Test Method for Compressive Properties Of Rigid Cellular Plastics
 - 5. ASTM D4716 Standard Test Method for Determining the (In-plane) Flow Rate per Unit Width and Hydraulic Transmissivity of a Geosynthetic Using a Constant Head
- C. American Concrete Institute (ACI):
- 1. ACI 304 Guide for Measuring, Mixing, Transporting and Placing Concrete
- D. Federal Highway Administration (FHWA)
- 1. FHWA SA-96-069R Manual for the Design and Construction Monitoring of Soil Nail Walls
 - 2. FHWA IF0-03-017 Geotechnical Engineering Circular No. 7: Soil Nail Walls
 - 3. FHWA SA-93-068 Soil Nailing Field Inspectors Manual

1.5 CONSTRUCTION SITE SURVEY

- A. Refer to Section 02 22 00, Existing Conditions Assessment, and Section 31 09 13, Geotechnical Instrumentation and Monitoring
- B. The Contractor shall visually observe the conditions above the soil nail wall on a daily basis for signs of ground or building movements and immediately notify the Contracting Officer if signs of movements such as new cracks in structures, increased size of old cracks, or separation of joints in structures, foundations, streets or paved and unpaved surfaces are observed.

1.6 SUBMITTALS

- A. Obtain Contractor's geotechnical engineer's (CGE) review and approval and the Contracting Officer's acceptance of the following submittals prior to beginning wall construction. Changes or deviations from the approved submittals shall be re-submitted for approval. No adjustments in contract time will be allowed due to incomplete submittals.
- B. At least 30 days prior to initiating the work in this section, submit:
 - 1. Contractor personnel qualifications.
 - 2. A quality control plan
 - 3. A detailed design including calculations and plans in accordance with FHWA SA-96-069 Manual for the Design and Construction Management of Soil Nail Walls and FHWA IF0-03-017 GEC No. 7: Soil Nail Walls requirements for Design-Build contracts.
 - 4. A detailed construction sequence and planned start of work date.
 - 5. Methods of excavating staged lifts and excavation equipment types.
 - 6. Drilling methods and equipment including proposed drillhole diameter to achieve the specified pullout resistance and any variation of these along the alignment.
 - 7. Nail grout mix design including:
 - a. Brand and type of Portland cement.

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- b. Source, gradation, and quality of all aggregates.
 - c. Proportions of mix by weight and water-cement ratio.
 - d. Manufacturer and brand name of all admixtures (where allowed).
 - e. Compressive strength test results (per AASHTO T106) verifying the specified minimum 3 and 28 day grout compressive strengths. Previous test results for the same grout mix completed within one year of the start of work may be submitted for verification of the required compressive strengths.
- 8. Nail grout placement procedures and equipment.
- 9. Soil nail testing methods and equipment including:
 - a. Details of the jacking frame and appurtenant bracing.
 - b. Details showing methods of isolating test nails during shotcrete application (i.e., methods to prevent bonding of the soil nail bar and the shotcrete during testing).
 - c. Details showing methods of grouting the unbonded length of test nails after completion of testing.
 - d. Equipment list.
- 10. Identification number and certified calibration records for each load cell and test jack pressure gauge to be used. Calibration records shall include the date tested, device identification number, and the calibration test results and shall be certified for an accuracy of at least 2 percent of the applied certification loads by a qualified independent testing laboratory within 90 days prior to submittal.
- 11. Certified mill test results for nail bars from each heat specifying the ultimate strength, yield strength, elongation and composition (may be submitted as delivered).
- 12. Manufacturer certifications for the soil nail centralizers, epoxy coating or encapsulation, and soil nail bar couplers (may be submitted as delivered).
- 13. A detailed construction drainage control plan addressing all elements necessary to divert, control, and dispose of surface water in accordance with Contract requirements.
- 14. Formwork design calculations and details for casting the CIP facing prepared by a California registered Professional Engineer.
- C. Installation Records: Submit, on a weekly basis, installation records of all work in general accordance with the requirements of FHWA SA-93-068 Soil Nail Field Inspectors Manual.
- D. Project Record Documents (As-Built): At completion of work, submit written report for soil nails to provide as-built information including: actual locations, actual lengths, date of drilling and installation and results of nail testing. Submit record drawings in accordance with Contract requirements.

1.7 QUALITY ASSURANCE

- A. The Contractor's superintendent shall have a minimum of 5 years experience supervising soil nailing work and the drill operators and on-site supervisors shall have a minimum of 3 years experience installing permanent soil nails or ground anchors. Prior to starting the work, the Contractor shall submit a list identifying the superintendent, drill rig operators, and on-site supervisors assigned to the work. The list shall contain a summary of each individual's experience and shall be sufficiently complete for the CGE to evaluate the individual's qualifications. The Contractor shall not use consultants or manufacturer's representatives to satisfy the requirements of this paragraph. The work shall not be started nor materials ordered until written approval of the Contractor's qualifications is given.

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- B. **Quality Plan:** The Contractor shall incorporate a Quality Plan, covering all earth structure systems operations and the field quality control to be performed by the Contractor in its Quality Management Plan. The Quality Plan shall include a schedule of all tests specified to be performed by the Contractor.
- C. **Quality Control:** The Contractor shall provide quality control measures to ensure compliance with specified requirements and the Quality Plan. Furnish surveillance during construction to be performed by a California registered Geotechnical Engineer employed by the Contractor (Contractor's geotechnical engineer (CGE)), as required to comply with the California Building Code, Chapter 33 and Chapters 18 and 18A, and other applicable regulations. Foundation and subgrade preparation, installation of geosynthetic reinforcement and wall units, and the placement and compaction of fills shall be performed under the surveillance of a California registered Geotechnical Engineer employed by the Contractor, as required to comply with the California Building Code, Chapter 33 and Chapters 18 and 18A, and other applicable regulations.
 - 1. When special inspections are required under the California Building Code, Chapters 17 and 17A, as applicable, make arrangements through the Contracting Officer with Authority-hired inspection agency and ensure that inspections are performed.
- D. **Inspection and Testing:** The Contractor shall engage the services of an approved independent soils/materials testing laboratory to perform tests. The CGE may perform these services.

1.8 MATERIALS HANDLING AND STORAGE

- A. Refer to Section 03 62 00, Non-Shrink Grouting. Cement shall be adequately stored to prevent moisture degradation and partial hydration. Cement that has become caked or lumpy shall not be used.
- B. Refer to Section 31 23 36 Aggregate Drainage Layer. Aggregates shall be stored so that segregation and the inclusion of foreign materials are prevented. The bottom 6 inches of aggregate piles in contact with the ground shall not be used in production.
- C. All steel reinforcement shall be carefully handled and shall be stored on supports to keep the steel from contact with the ground. Do not use nail steel damaged as a result of abrasion, cuts, nicks, welds, and weld splatter. Do not ground welding leads to the nail steel. Nail steel shall be protected from and sufficiently free of dirt, rust, and other deleterious substances prior to installation. Do not use nail steel that is heavily corroded or pitted. Light rust that has not resulted in pitting is acceptable.
- D. Encapsulated nails shall not be transported until the encapsulation grout has reached sufficient strength to resist damage during handling. Encapsulated nails shall not be handled in a manner that will cause large deflections or distortions during handling. When handling or transporting encapsulated nails, the Contractor shall provide slings or other equipment necessary to prevent damage to the nail tendon. Encapsulated nails shall not be dropped during handling and shall be protected from impact of any kind. Any encapsulated nails that are damaged or defective shall be repaired in accordance with the manufacturer's recommendations or shall be rejected and removed from the site. Epoxy coating shall be repaired in accordance with the coater's recommendations using an epoxy field repair kit approved by the epoxy manufacturer.

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CALIFORNIA HIGH-SPEED TRAIN PROJECT – SPECIAL SPECIFICATIONS**Agreement No: HSR13-06****PART 2 - PRODUCTS****2.1 SOIL NAIL WALLS, GENERAL**

- A. Materials for construction of soil nail walls shall be furnished new and without defects. Defective materials shall be removed from the job site. Materials for soil nail structures shall consist of the following:
- B. Centralizers: Schedule 40 PVC, steel or other material not detrimental to the nail steel (wood shall not be used); securely attached to the nail bar; sized to position the nail bar within 1 inch of the center of the drillhole; sized to allow tremie pipe insertion to the bottom of the drillhole; and, sized to allow grout to freely flow up the drillhole.
- C. Nail Grout: The grout shall be a neat or sand/cement mixture with a minimum 3-day compressive strength of 1500 psi and a minimum 28-day compressive strength of 3000 psi per AASHTO T106.
- D. Cement: AASHTO M85, Type I, II, III or V.
- E. Fine Aggregate: Clean, natural sand, ASTM C33. Artificial or manufactured sand is acceptable provided it is suitable for pumping in accordance with ACI 304, 4.2.2.
- F. Excavation Face Protection: Polyethylene film per AASHTO M171.
- G. Bar Couplers: Bar couplers shall develop the full ultimate tensile strength of the bar as certified by the manufacturer.
- H. Solid Bar Nails: AASHTO M31, for Grade 60 or 75, ASTM A722 for Grade 150 continuous, without splices or welds, deformed continuous thread bar or threaded at least 6 inches on one end, new, straight, undamaged, epoxy coated or encapsulated as shown on the plans. If threads are cut into a reinforcing bar, the next larger bar number designation from that shown on the shop drawings or Construction Drawings shall be used.
- I. Epoxy Coating: AASHTO M284. Minimum 14 mil electrostatically applied. Bend test requirements shall be waived.
- J. Encapsulation: Minimum 0.04-in thick, corrugated, HDPE tube conforming to AASHTO M252 or corrugated PVC tube conforming to ASTM D1784, Class 13464-B.
- K. Drainage Geocomposite: Geocomposite Sheet Drain. Manufactured with a drainage core (e.g., geonet) and a drainage geotextile attached to or encapsulating the core. Drainage core to be manufactured from long chain synthetic polymers composed of at least 85 percent by mass of polypropylenes, polyester, polyamine, polyvinyl chloride, polyolefin, or polystyrene and having a minimum compressive strength of 40 psi when tested in accordance with ASTM D1621 Procedure A. The drainage core with the geotextile fully encapsulating the core shall have a minimum flow rate of 5 gallons per minute per foot of width tested in accordance with ASTM D4716. The test conditions shall be under an applied load of 10 psi at a gradient of 1.0 after a 100-hour seating period.
- L. Shotcrete: Refer to Section 03 37 13, Shotcrete, and Caltrans Standard Specifications, Section 53, for requirements. Admixtures shall not be used unless accepted by the Contracting Officer.

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Admixtures used to entrain air, to reduce water-cement ratio, to retard or accelerate setting time, or to accelerate the development of strength, shall be thoroughly mixed into the shotcrete at the rate specified by the manufacturer unless specified otherwise. Accelerating additives shall be compatible with the cement used, be non-corrosive to steel and shall not promote other detrimental effects such as cracking or excessive shrinkage. The maximum allowable chloride ion content of all ingredients shall not exceed 0.10 percent when tested per AASHTO T260.

- M. Shotcrete and CIP Facing Reinforcing: Refer to Section 03 20 00, Concrete Reinforcing
- N. Bearing Plates: Refer to Section 05 12 00, Structural Steel Framing

PART 3 - EXECUTION**3.1 DRAINAGE CONTROL**

- A. Soil nailing shall only be used where the regional groundwater table has been determined to be below the level of the excavation based on the results of the geotechnical site investigation. Localized areas of perched water may be encountered at the interface of geologic units.
- B. The Contractor shall provide positive control and discharge of all surface water encountered during construction to the extent necessary to prevent adverse conditions. Damage caused by the failure to control surface water shall be repaired by the Contractor.
- C. Refer to Section 31 23 19, Dewatering, for additional information. Existing subsurface drainage features encountered during excavation shall be brought to the immediate attention of the CGE. Work in these areas shall be suspended until remedial measures meeting the CGE approval are implemented by the Contractor. Surface water runoff flow and flows from existing subsurface drainage features shall be captured independently of the wall drainage network and conveyed to an outfall structure or storm sewer as approved by the CGE.
- D. The Contractor shall be responsible for the condition and maintenance of any pipe or conduit used to control surface water during construction. Upon substantial completion of the work, surface water control pipes or conduits shall be removed from the site. Alternatively, pipes or conduits that are left in place with the approval of the CGE shall be fully grouted (abandoned) or left in a manner that protects the structure and all adjacent facilities from migration of fines through the pipe or conduit and potential ground loss.

3.2 EXCAVATION

- A. During mass grading, the Contractor shall maintain a bench of native material to serve as a platform for the drilling equipment and a berm against the final wall excavation face. The bench shall be established not more than 3 feet below the row of nails to be installed and shall extend out from the wall face a minimum distance necessary to provide a safe working bench for the drill equipment and workers.
- B. Excavating of the ground beyond the final wall face shall not be allowed. Any inadvertent overexcavation beyond the final wall face shall be restored by the Contractor using a method approved by the CGE.

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- C. Excavation to the final wall excavation face (neat line) shall be done using procedures that:
1. Prevent ground loss, swelling, air slacking, or loosening;
 2. Minimize degradation of soil bearing support below the overlying portions of the soil nail wall and below the soil nails currently being installed;
 3. Prevent premature loss of soil moisture at the face;
 4. Prevent ground freezing; and
 5. Reduce the potential for shotcrete overages.
- D. Excavation to the final wall excavation face (neat line) and application of the shotcrete shall be completed in the same work shift unless otherwise approved by the CGE. No approval for extension of the face exposure period shall be granted until a test cut is constructed and the Contractor demonstrates for each material type that the unsupported final excavation face will be stable over the proposed extension of the exposure period. Risk of damage to existing structures or structures included in the work shall be borne by the Contractor where approval for extended face exposure period is granted. Where extension of the face exposure period is allowed, the Contractor shall provide and install polyethylene sheets (properly anchored to the top and bottom of the excavation) to reduce degradation of the cut face caused by changes in soil moisture unless otherwise approved by the CGE.
- E. Subsequent excavation lifts shall not be advanced until nail installation (including bearing plate and nut), reinforced shotcrete placement, and nail testing for the preceding lifts are complete and acceptable to the CGE. Prior to advancing the excavation, nail grout and shotcrete on the preceding lift shall have reached 100 and 50 percent of their 28-day compressive strengths, respectively. Exposed native ground shall not have an unsupported cut height greater than the vertical nail spacing plus the required reinforcing lap.
- F. Where the Contractor's excavation and installation methods result in a discontinuous wall along any nail row, the ends of the wall shall extend beyond the ends of the next lower lift by at least 10 feet. Slopes at these discontinuities shall be constructed to prevent sloughing or failure of the temporary slopes.
- G. Cobbles, boulders, rubble, or debris that are encountered at the soil face during excavation and that, protrude from the soil face shall be the responsibility of the Contractor. The Contractor shall be responsible for constructing the shotcrete construction facing and the finish structural facing to the specified minimum thickness and to the line and grade indicated in the Construction Drawings. Removal of face protrusions to accomplish this construction shall be determined by the Contractor. The Contractor shall notify the CGE of the proposed method for mitigation of face protrusions at least 24 hours prior to initiation of the work. Should the removal of face protrusions result in voids beyond the finish face line (neat line), the Contractor shall determine the appropriate method of backfilling and shall submit to the CGE such method(s) at least 24 hours prior to initiating the work.

3.3 NAIL INSTALLATION

- A. Successful verification tests shall be performed prior to starting installation of production nails. The number and location of the verification tests shall be shown on the plans and shall meet FHWA requirements. Additional verification tests may be required if the Contractor modifies the installation methods from those used during the installation of the approved verification test.

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- B. Nails shall be installed prior to the application of shotcrete. Reinforced shotcrete may be installed prior to installing the soil nails provided that the construction sequence and calculations demonstrate that the bearing plates are adequate to span the nail hole or block out.

3.4 DRILLING

- A. The Contractor shall select drilling equipment and methods suitable for the ground conditions. Drillhole diameter shall be selected to provide the minimum specified grout cover over the soil nail tendon and to develop the specified load carrying capacity. It is the Contractor's responsibility to determine the final drillhole diameter required to provide the specified pullout resistance. Uncased drillholes shall be observed for cleanliness prior to insertion of the soil nail tendon. In caving ground, the Contractor shall use cased drilling methods to support the sides of the drill holes.
- B. The Contractor shall immediately suspend drilling operations if ground subsidence is observed, if the soil nail wall is adversely affected, or if adjacent structures are damaged as a result of the drilling operation. The adverse conditions shall be stabilized immediately and the Contracting Officer shall be notified of such conditions within 24 hours.

3.5 NAIL TENDON INSTALLATION

- A. Nail tendons shall be fitted with centralizers and shall be inserted into the drillhole to the required length without difficulty and in such a manner as to prevent damage to the drillhole or the tendon corrosion protection. Tendons that cannot be fully inserted to the design depth shall be removed from the drillhole and the drillhole shall be cleaned sufficiently to allow unobstructed installation of the tendon.
- B. Where the nail tendon is installed using cased or hollow-stem auger methods, centralizers are not required provided the installation method ensures that the tendon will remain in the central portion of the nail grout. In such situations, grout slump shall not exceed 8 inches.

3.6 GROUTING

- A. Grout equipment shall produce a uniformly mixed grout free of lumpy and undispersed cement. A positive displacement grout pump shall be used. The pump shall be equipped with a pressure gauge that can measure at least twice but no more than three times the intended grout pressure. The grouting equipment shall be sized to enable the entire nail to be grouted in one continuous operation. The mixer shall be capable of continuously agitating the grout during usage.
- B. The drillhole shall be grouted after installation of the nail tendon. Grouting prior to insertion of the nail tendon can be allowed provided neat cement grout is used and the nail bar is immediately inserted through the grout to the specified length without difficulty. No portion of the nail hole shall be left open for more than 60 minutes prior to grouting unless otherwise approved by the CGE.
- C. The grout shall be injected at the lowest point of each drillhole through a grout tremie pipe, casing, hollow-stem auger, or drill rods with the drillhole filled in one continuous operation. Cold joints in the grout placement are allowed for construction of proof test nails. The conduit delivering the grout shall be kept below the surface of the grout as the conduit is withdrawn. The grouting conduit shall be withdrawn as the nail hole is filled in a manner which prevents the

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creation of voids. The quantity of grout and the grouting pressures shall be recorded for each soil nail. Grout pressures shall be controlled to prevent excessive ground heave or fracturing.

- D. During casing removal for drillholes advanced by either cased or auger-cast methods, the grout surface within the casing shall be continually monitored for maintenance of "head" sufficient to offset the external groundwater/soil pressure. Casing seals shall not be broken until the level of grout within the casing provides adequate head to prevent unstable soil or groundwater from contaminating or diluting the grout. Grout pressures shall be maintained to ensure that the drillhole will be completely filled with grout.
- E. If the grouting of any nail is suspended for more than 30 minutes or if the quality of the grout placement results in a nail that does not satisfy the requirements of this specification, then the steel and grout shall be removed from the hole, disposed of, and replaced with fresh grout and undamaged steel.
- F. Nail grout shall have a minimum compressive strength of 1500 psi in 3 days and 3000 psi in 28 days. Nail grout shall be tested by the Contractor in accordance with AASHTO T106/ASTM C109 at a frequency of no less than one test for every 50 cubic yards of grout placed or once per week, whichever comes first.

3.7 PROOF TEST NAIL UNBONDED LENGTH

- A. Temporary unbonded lengths shall be provided for each proof test nail. The test nail bar shall be isolated from the shotcrete facing and the reaction frame used during testing. Isolation of a test nail through the shotcrete facing shall not affect the location of the reinforcing steel under the bearing plate. Accepted proof test nails may be incorporated in the work provided the temporary test unbonded length is fully grouted subsequent to testing. Test nail isolation methods, methods for providing an unbonded length, and methods for grouting the unbonded length subsequent to testing shall be submitted to the CGE for review and approval in accordance with the requirements of the Submittal section of this Contract.

3.8 NAIL TESTING

- A. Verification and proof testing shall be performed in accordance with FHWA requirements. Proof tests shall be performed at locations selected by the CGE. All required test data shall be recorded by the CGE, unless another entity recording such data is acceptable to the CGE. Testing of nails shall not be performed until the nail grout and shotcrete facing have attained at least 50 percent of their specified 28-day compressive strengths.
- B. Where temporary casing of the unbonded length of test nails is provided, the casing shall be installed to prevent any reaction between the casing and the grouted bond length of the nail and/or the stressing apparatus.
- C. Testing equipment shall include two dial gauges, a dial gauge support, jack and pressure gauge, an electric load cell, and a reaction frame. The load cell is required for verification tests only.
- D. A minimum of two dial gauges capable of measuring to 0.001 inch shall be available at the site to measure the nail movement. The dial gauges shall have a minimum travel sufficient to allow the test to be performed without re-setting the dial gauge. The dial gauges shall be aligned within 5 degrees of the axis of the nail and shall be supported independent of the jacking set-up and the wall. A hydraulic jack, pressure gauge, and pump shall be used to apply and measure the test

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load. The nail loads during verification tests shall be monitored with both a pressure gauge and electric load cell. The load cell shall be used to maintain constant load hold throughout the creep test during verification testing. The Contractor shall provide recent calibration curves in accordance with the Submittals.

- E. The jack and pressure gauge shall be calibrated by an independent testing laboratory as a unit. The pressure gauge shall be graduated in 100 psi increments or less and shall have a range not exceeding twice the anticipated maximum pressure during testing unless otherwise approved by the CGE. The ram travel of the jack shall be sufficient to enable the test to be performed without re-setting the jack. The jack shall be capable of applying each test load increment in less than 1 minute.
- F. The jack shall be independently supported and centered over the nail so that the nail does not carry the weight of the jack. The stressing equipment shall be placed over the nail in such a manner that the jack, bearing plates, load cell, and stressing anchorage are in alignment. The jack shall be positioned at the beginning of the test such that unloading and repositioning of the jack during the test will not be required.
- G. The reaction frame shall be sufficiently rigid and of adequate dimension such that excessive deformation of the test apparatus requiring repositioning of any components does not occur during testing. Where the reaction frame bears directly on the shotcrete facing, the reaction frame shall be designed to prevent fracture of the shotcrete and no part of the reaction frame shall bear within 6 inches of the edge of the test nail breakout.
- H. Verification Testing :
 - 1. Verification testing shall be performed prior to installation of production nails to verify the Contractor's installation methods, soil conditions, nail pullout capacity, and design assumptions. The nails used for the verification tests shall be sacrificial and shall not be incorporated as production nails.
 - 2. The details of the verification testing arrangement including the method of distributing test load pressures to the excavation surface (reaction frame), test nail bar size, grouted hole diameter and reaction plate dimensioning, shall be developed by the Contractor and submitted to the CGE for approval. Test nails shall be constructed using the same equipment, methods, and hole diameter as planned for the production nails. Changes in the drilling or installation method may require additional verification testing as determined by the Contracting Officer.
 - 3. Test nails shall have both bonded and unbonded lengths. Prior to testing only the bonded length of the test nail shall be grouted. The unbonded length of the test nail shall be at least 3 feet unless otherwise approved by the CGE. The bonded length of the test nail shall be determined by the CGE based on the bar grade and size such that the allowable bar structural load is not exceeded, but shall not be less than 10 feet. The allowable bar structural load during testing shall not exceed 80 percent of the steel ultimate strength for Grade 150 bars or 90 percent of the yield strength for Grade 60 and 75 bars.
 - 4. The verification test bonded length L_{BV} shall not exceed the test allowable bar structural load divided by 2 times the design Pullout Resistance value. The following equation shall be used for determining the test nail bond length to avoid structurally overstressing the verification nail bar size:

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$$L_{BV} \leq \frac{C f_y A_s}{2 A_D}$$

Where: L_{BV} = Maximum Verification Test Nail Bond Length (ft)
 f_y = Bar Yield Stress (ksi)
 A_s = Bar Area (in²)
 A_D = Design Pullout Resistance (kip/ft)
 C = 0.8 for Grade 150 bars and 0.9 for Grade 60 and 75 bars

5. The design test load during testing shall be determined by the following equation:

$$DTL = L_B \times A_D$$

Where DTL= Design test load
 L_B = As-built bonded test length (ft)
 A_D = Design pullout resistance (specified on plans as kip/ft)

6. Verification test nails shall be incrementally loaded to twice the design test load (DTL) followed by unloading in accordance with the following schedule. The soil nail movements at each load and unload increment shall be recorded.

| <u>LOADING</u> | | | <u>UNLOADING</u> | |
|------------------|------------------|--|------------------|------------------|
| <u>LOAD</u> | <u>HOLD TIME</u> | | <u>LOAD</u> | <u>HOLD TIME</u> |
| AL(.05 DTL max.) | 1 minute | | 1.75DTL | Until Stable |
| 0.25DTL | 10 minutes | | 1.50DTL | Until Stable |
| 0.50DTL | 10 minutes | | 1.25DTL | Until Stable |
| 0.75DTL | 10 minutes | | 1.00DTL | Until Stable |
| 1.00DTL | 10 minutes | | 0.75DTL | Until Stable |
| 1.25DTL | 10 minutes | | 0.50DTL | Until Stable |
| 1.50DTL | 60 minutes | | 0.25DTL | Until Stable |
| 1.75DTL | 10 minutes | | AL | Until Stable |
| 2.00DTL | 10 minutes | | | |

7. The alignment load (AL) should be the minimum load required to align the testing apparatus and should not exceed 5 percent of the design test load (DTL). Dial gauges should be set at "zero" after the alignment load has been applied.
8. Each load increment shall be held for at least 10 minutes. The verification test nail shall be monitored for creep at the 1.50 DTL load increment. Nail movements during the creep portion of the test shall be measured and recorded at 1, 2, 3, 5, 6, 10, 20, 30, 50, and 60

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minutes. The load during the creep test shall be maintained within 2 percent of the intended load by use of the load cell. The nail shall be unloaded in increments of 25 percent of the DTL with movements recorded at each unload increment. Each unload increment shall be held only for a sufficient time to allow stabilization of the movement reading.

I. Proof Testing

1. Proof testing shall be performed on 5 percent of the production nails in each shotcrete lift. The locations and number of these tests shall be determined by the CO.
2. Proof test nails shall have both bonded and unbonded lengths. Prior to testing only the bonded length of the test nail shall be grouted. The CGE shall determine the bonded and unbonded lengths of each test nail. The unbonded length of the test nail shall be at least 3 feet. The bonded length of the test nail shall be determined by the CGE such that the allowable bar structural load is not exceeded but shall not be less than 10 feet. The allowable bar structural load during testing shall not exceed 80 percent of the steel ultimate strength for Grade 150 bars or 90 percent of the steel yield strength for Grade 60 and 75 bars.
3. The proof test bonded length LBP shall not exceed the test allowable bar load divided by 1.5 times the design Pullout Resistance value. The following equation shall be used for sizing the test nail bond length to avoid overstressing the production bar size:

$$L_{BP} \leq \frac{C f_y A_s}{1.5 A_D}$$

Where: L_{BP} = Maximum Proof Test Nail Bond Length (ft)
 f_y = Bar Yield Stress (ksi)
 A_s = Bar Stress Area (in²)
 A_D = Design Pullout Resistance (kip/ft)
 C = 0.8 for Grade 150 bars and 0.9 for Grade 60 and 75 bars

4. Proof tests shall be performed by incrementally loading the nail to 150 percent of the design test load (DTL). The design test load shall be determined as for verification test nails. The nail movement at each load shall be measured and recorded by the CGE in the same manner as for verification tests. The load shall be monitored by a pressure gauge with a sensitivity and range meeting the requirements of pressure gauges used for verification test nails. At load increments other than maximum test load, the load shall be held long enough to obtain a stable reading. Incremental loading for proof tests shall be in accordance with the following schedule.

AL (.05 DTL max.)
 0.25DTL
 0.50DTL
 0.75DTL
 1.00DTL
 1.50DTL (Maximum test load)

Where: AL = Nail Alignment Load
 DTL = Nail Design Test Load

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5. The alignment load (AL) should be the minimum load required to align the testing apparatus and should not exceed 5 percent of the design test load (DTL). Dial gauges should be set at "zero" after the alignment load has been applied.
6. All load increments shall be maintained within 5 percent of the intended load. Depending on performance, either 10 minute or 60 minute creep tests shall be performed at the maximum test load (1.50 DTL). The creep period shall start as soon as the maximum test load is applied and the nail movement shall be measured and recorded at 1 minutes, 2, 3, 5, 6, and 10 minutes. Where the nail movement between 1 minute and 10 minutes exceeds 0.04 inches, the maximum test load shall be maintained an additional 50 minutes and movements shall be recorded at 20, 30, 50, and 60 minutes.

J. Test Nail Acceptance Criteria

1. For verification tests: a creep rate less than 0.08 inches per log cycle of time between the 6 and 60 minute readings is observed during creep testing and the rate is linear or decreasing throughout the creep test load hold period.
2. For proof tests: (a) a total creep movement of less than 0.04 inches is observed between the 1 and 10 minute readings or a total creep movement of less than 0.08 inches is observed between the 6 and 60 minute readings and; (b) the creep rate is linear or decreasing throughout the creep test load hold period.
3. The total movement at the maximum test load exceeds 80 percent of the theoretical elastic elongation of the test nail unbonded length.
4. A pullout failure does not occur at the maximum test load. Pullout failure is defined as the load at which attempts to increase the test load simply result in continued pullout movement of the test nail. The pullout failure load shall be recorded as part of the test data.
5. At the Contractor's option, successful proof test nails meeting the above test acceptance criteria may be incorporated as production nails, provided that (1) the unbonded test length of the nail hole has not collapsed during testing, (2) the minimum required hole diameter has been maintained, (3) the specified corrosion protection is provided, and (4) the test nail length is equal to or greater than the scheduled production nail length. Test nails meeting these requirements shall be completed by satisfactorily grouting the unbonded test length. Maintaining the temporary unbonded test length for subsequent grouting is the Contractor's responsibility. If the unbonded test length of production proof test nails cannot be satisfactorily grouted subsequent to testing, the proof test nail shall become sacrificial and the Contractor shall replace the proof test nail with a production nail installed to the satisfaction of the CGE.

K. Test Nail Rejection

1. The CGE shall evaluate the results of each verification test. Installation methods that do not satisfy the nail testing requirements shall be rejected. The Contractor shall propose alternative methods and install replacement verification test nails. Replacement test nails shall be installed and tested at no additional cost to the Authority.
2. The CGE may require that the Contractor replace some or all of the installed production nails between the failed proof test nail and the adjacent passing proof test nail. Alternatively, the CGE may require proof testing of additionally installed proof test nails

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be conducted to verify that adjacent previously installed production nails have sufficient load carrying capacity.

3. The CGE modifications may include the installation of additional test and/or production nails (i.e., decreased nail spacing from that shown on the Construction Drawings), installing longer production nails, increasing the drillhole diameter, or modifying the installation methods.
4. Costs due to additional proof tests, verification tests or installation of additional or modified nails as a result of proof test nail failure(s) shall be at no additional cost to the Authority.

3.9 TOLERANCES

- A. The soil nails shall not extend beyond the right-of-way or the limits of soil nail easements, where applicable. Bars shall be centered within 1 inch of the center of the drill hole. Individual nails shall be positioned plus or minus 12 inches from the design locations shown in the Construction Drawings. Location tolerances shall be considered applicable to only one nail and not cumulative over large wall areas. The nail inclination shall be plus or minus 3 degrees of that shown in the Construction Drawings. Soil nails that do not satisfy the specified tolerances due to the Contractor's installation methods shall be replaced to the CGE's satisfaction

3.10 INSTALLATION RECORDS

- A. Accurate records documenting the soil nail wall construction shall be maintained by the CGE.
- B. The Contractor shall assist the CGE as necessary to obtain the as-built nail locations and all other information as required by the CGE.

END OF SECTION

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SECTION 31 66 16

SPECIAL FOUNDATION WALLS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Soldier Piles.
- B. Secant Piles.
- C. Tangent Piles.
- D. Controlled Low-Strength Material (CLSM).
- E. Timber Lagging.
- F. Secant Lagging.
- G. Steel Plate Lagging.
- H. Shotcrete Lagging.

1.2 RELATED SECTIONS

- A. Section 03 20 00, Concrete Reinforcing.
- B. Section 03 30 00, Cast-in-Place Concrete.
- C. Section 05 12 00, Structural Steel Framing.
- D. Section 31 09 13, Geotechnical Instrumentation and Monitoring.
- E. Section 31 39 13, Ground Anchors.
- F. Section 03 37 13, Shotcrete.
- G. Section 31 63 29, Drilled Concrete Piers and Shafts.
- H. Section 33 05 25, Support and Protection of Utilities.
- I. Section 02 22 00, Existing Conditions Assessment.

1.3 REFERENCE STANDARDS

- A. American Association of State Highway and Transportation Officials (AASHTO)
 - 1. M270 Standard Specification for Structural Steel for Bridges

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1. ASTM A36 Standard Specification for Carbon Structural Steel
2. ASTM A572 Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel
3. ASTM A913 Standard Specification for High-Strength Low-Alloy Steel Shapes of Structural Quality, Produced by Quenching and Self-Tempering Process (QST)
4. ASTM A992 Standard Specification for Structural Steel Shapes
5. ASTM A283 Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates
6. ASTM A588 Standard Specification for High-Strength Low-Alloy Structural Steel
7. ASTM D1784 Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds
8. ASTM D1621 Standard Test Method for Compressive Properties Of Rigid Cellular Plastics
9. ASTM D4716 Standard Test Method for Determining the (In-plane) Flow Rate per Unit Width and Hydraulic Transmissivity of a Geosynthetic Using a Constant Head

C. International Association of Foundation Drilling (ADSC):

1. ADSC Standards and Specifications for the Foundation Drilling Industry (Standards and Specifications)

D. American Concrete Institute (ACI)

1. 229R-99 Controlled Low Strength Materials
2. ACI 336.1 Specification for the Construction of Drilled Piers.

1.4 CONSTRUCTION SITE SURVEY

- A. Refer to Section 02 22 00, Existing Conditions Assessment, and Section 31 09 13, Geotechnical Instrumentation and Monitoring.
- B. The Contractor shall visually observe the conditions above the wall on a daily basis for signs of ground or building movements and immediately notify the Contracting Officer if signs of movements such as new cracks in structures, increased size of old cracks, or separation of joints in structures, foundations, streets or paved and unpaved surfaces are observed..

1.5 QUALITY ASSURANCE

- A. The Contractor's superintendent shall have a minimum of 5 years experience supervising similar work. The drill operators and on-site supervisors shall have a minimum of 3 year experience installing similar work. Prior to starting the work, the Contractor shall submit a list identifying the superintendent, drill rig operators, and on-site supervisors assigned to the project. The list shall contain a summary of each individual's experience and shall be sufficiently complete for the Contractor's geotechnical engineer (CGE) to evaluate the individual's qualifications. The Contractor shall not use consultants or manufacturer's representatives to satisfy the requirements

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of this paragraph. Work shall not be started nor materials ordered until written approval of the Contractor's qualifications is given.

- B. **Quality Plan:** The Contractor shall submit a Quality Plan, as part of its Quality Management Plan, covering all earth structure systems operations and the field quality control to be performed by the Contractor. The Quality Plan shall include a schedule of all tests specified to be performed by the Contractor.
- C. **Quality Control:** The Contractor shall provide quality control measures to ensure compliance with specified requirements and the Quality Plan. Furnish surveillance during construction to be performed by a California registered Geotechnical Engineer employed by the Contractor (Contractor's geotechnical engineer (CGE)), as required to comply with the California Building Code, Chapter 33 and Chapters 18 and 18A, and other applicable regulations. Foundation and subgrade preparation, installation of geosynthetic reinforcement and wall units, and the placement and compaction of fills shall be performed under the surveillance of a California registered Geotechnical Engineer employed by the Contractor, as required to comply with the California Building Code, Chapter 33 and Chapters 18 and 18A, and other applicable regulations.
 - 1. When special inspections are required under the California Building Code, Chapters 17 and 17A, as applicable, make arrangements through the Contracting Officer with Authority-hired inspection agency and ensure that inspections are performed.
- D. **Inspection and Testing:** The Contractor shall engage the services of an approved independent soils/materials testing laboratory to perform tests. The CGE may perform these services.

1.6 SUBMITTALS

- A. Obtain the Contractor's geotechnical engineer's (CGE) review and approval and the Contracting Officer's acceptance of the following submittals prior to beginning wall construction. Changes or deviations from the approved submittals shall be re-submitted for approval. No adjustments in Contract time will be allowed due to incomplete submittals.
- B. **Pile Installation Plan:** The Contractor shall submit a pile installation plan to the CGE for approval for all piling. The pile installation plan shall be submitted at least 30 days before constructing piling and shall include complete descriptions, details, and supporting calculations for the following:
 - 1. Design calculations sealed by a California Registered Professional Engineer.
 - 2. Concrete mix design, certified test data, and trial batch reports.
 - 3. Drilling or coring methods and equipment.
 - 4. Proposed method for casing installation and removal when necessary.
 - 5. Plan view drawing of pile showing reinforcement. Include inspection pipes on the drawing if inspection pipes are required.
 - 6. Methods for placing, positioning, and supporting bar reinforcement.
 - 7. Methods and equipment for determining the depth of concrete and actual and theoretical volume placed, including effects on volume of concrete when any casings are withdrawn.
 - 8. Methods and equipment for verifying that the bottom of the drilled hole is clean before placing concrete.

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9. Methods and equipment for preventing upward movement of reinforcement, including the Contractor's means of detecting and measuring upward movement during concrete placement operations.
- C. For concrete placed under slurry, the pile installation plan shall also include complete descriptions, details, and supporting calculations for the following:
1. Concrete batching, delivery, and placing systems, including time schedules and capacities. Time schedules shall include the time required for each concrete placing operation at each pile.
 2. Concrete placing rate calculations. When requested by the CGE, calculations shall be based on the initial pump pressures or static head on the concrete and losses throughout the placing system, including anticipated head of slurry and concrete to be displaced.
 3. Suppliers' test reports on the physical and chemical properties of the slurry and any proposed slurry chemical additives, including Material Safety Data Sheet.
 4. Slurry testing equipment and procedures.
 5. Methods of removal and disposal of excavation, slurry, and contaminated concrete, including removal rates.
 6. Methods and equipment for slurry agitating, recirculating, and cleaning.
- D. Submittal requirements for soldier pile and lagging walls shall include the following:
1. Working Drawings indicating the general arrangement of the wall system, details, sequence of construction, and methods of assembly and removal.
 2. Manufacturers' product data and certificates of compliance.
 3. Method statements and contingency plans for the following events/processes:
 - a. Removing miscellaneous obstructions.
 - b. Maintaining stability of excavation between soldier piles.
 - c. Maintaining wall excavation and reinforcement installation within specified tolerances, and details of corrective measures should tolerances not be met.
 - d. Resolving difficulties arising from misalignment of soldier piles exposed during excavation, and criteria for implementing procedures.
4. Weekly construction progress reports containing the following:
- a. Soldier pile identification, date, start and end time of pile construction, diameter, top and bottom of pile elevations and any deviation of bottom of pile elevation from plan elevation.
 - b. Description of soils, groundwater elevations and conditions, obstructions encountered, unstable ground and extent of mitigations, and any other excavation issues.
 - c. Pile placement and backfilling. Indicate the theoretical/actual excavation volumes, type of backfill placed, elevations of backfill types.
 - d. Lagging installation, location, lagging type, backfill
 - e. Details of instrumentation installed.
5. Wall and reinforcement plumbness and deviation from drawings.

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CALIFORNIA HIGH-SPEED TRAIN PROJECT – SPECIAL SPECIFICATIONS**Agreement No: HSR13-06****PART 2 - PRODUCTS****2.1 STRUCTURAL STEEL SOLDIER PILES**

- A. The soldier pile is defined as the structural steel section(s) as well as any connecting plates used to join multiple sections. The types of soldier piles shall be defined as HP, W Sections, or Built-Up Sections. The structural steel components for the soldier piles shall conform to the requirements of AASHTO M270.
- B. W-Shapes: Wide-flange sections, as indicated and conforming to ASTM A992 Grade 50, A572 or A913 as applicable to the work.
- C. HP Shapes: HP sections, as indicated, conforming to, ASTM A572 or ASTM A913 as applicable to the work.
- D. The soldier pile encasement concrete shall be according to Section 03 30 00, Cast-in-Place Concrete.
- E. The Controlled Low-Strength Material (CLSM), used for backfilling shaft excavations above the soldier pile encasement concrete and up to the existing ground surface shall be supplied and installed according to ACI 229R-99.
- F. Temporary casing shall be produced by electric seam, butt, or spiral welding to produce a smooth wall surface, fabricated from steel satisfying ASTM A252 Grade 2. The minimum wall thickness shall be as required to resist the anticipated installation and dewatering stresses, as determined by the Contractor, but in no case less than 1/4 in.
- G. Drilling slurry shall contain of a polymer or mineral base material. Mineral slurry shall have both a mineral grain size that will remain in suspension with sufficient viscosity and gel characteristics to transport excavated material to a suitable screening system. The percentage and specific gravity of the material used to make the suspension shall be sufficient to maintain the stability of the excavation and to allow proper concrete placement.
- H. For polymer slurry, the calcium hardness of the mixing water shall not exceed 100 mg/L.
- I. Welding Electrodes: Refer to Section 05 05 22, Metal Welding, for requirements.
- J. Cleaning and Painting: Refer to Section 05 12 00, Structural Steel Framing, for requirements.
- K. CIP Facings: Refer to Section 03 30 00, Cast-in-Place Concrete, and Section 03 20 00, Concrete Reinforcing

2.2 REINFORCED CONCRETE SOLDIER PILES

- A. Tangent Piles and Secant Piles are soldier piles generally constructed of reinforced concrete but may also be reinforced with structural steel. For reinforced concrete soldier piles refer to Section 31 63 29, Drilled Concrete Piers and Shafts

2.3 LAGGING

- A. Timber Lagging. The minimum tabulated unit stress in bending, used for the design of the timber lagging, shall be 1000 psi unless otherwise specified. Timber lagging shall be sound, and free

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from any defects that may impair its strength. Timber shall be construction grade Douglas Fir, or Southern Yellow Pine.

- B. Timber lagging to be left in place shall be pressure treated per Federal Standard TT-W-571, Wood Preservation: Treating Practices. Timbers shall be American Wood Preserver's Bureau (AWPB) stamped and certified, and include the designation LP-22 for use in ground contact.
- C. The design or timber lagging shall be based on established practices published in FHWA or AASHTO documents considering lateral earth pressure, construction loading, traffic surcharges and the lagging span length(s). The nominal thickness of the lagging selected shall not be less than 3 inches and shall satisfy the minimum tabulated unit stress in bending. When the nominal timber lagging thickness(s) and allowable stress are specified, the timber shall be rough cut or surfaced
- D. Secant Lagging: The Controlled Low-Strength Material (CLSM), used for secant lagging shall be supplied and installed according to ACI 229R-99. The mix design shall provide a minimum 28-day compressive strength of 100-psi.
- E. Steel Plate Lagging: Steel lagging plates shall meet the requirements of ASTM A283 Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates, Grade C, or ASTM A588 Standard Specification for High-Strength Low-Alloy Structural Steel, up to 50 ksi Minimum Yield Point, with Atmospheric Corrosion Resistance.
- F. Shotcrete Lagging: Refer to Section 03 37 13, Shotcrete, Caltrans Standard Specifications, Section 53, and Section 03 20 00, Concrete Reinforcement, for requirements.

2.4 DRAINAGE

- A. Drainage Geocomposite: Geocomposite Sheet Drain shall be manufactured with a drainage core (e.g., geonet) and a drainage geotextile attached to or encapsulating the core. Drainage core to be manufactured from long chain synthetic polymers composed of at least 85 percent by mass of polypropylenes, polyester, polyamine, polyvinyl chloride, polyoleofin, or polystyrene and having a minimum compressive strength of 40 psi when tested in accordance with ASTM D1621 Procedure A. The drainage core with the geotextile fully encapsulating the core shall have a minimum flow rate of 5 gallons per minute per foot of width tested in accordance with ASTM D4716. The test conditions shall be under an applied load of 10 psi at a gradient of 1.0 after a 100-hour seating period.

PART 3 - EXECUTION**3.1 GENERAL**

- A. The Contractor shall employ all methods available to locate, avoid, and protect existing utilities along the line of the proposed excavation support installation. The Contractor shall protect all existing utilities within the construction influence zone in accordance with the requirements of the utility owner. The excavation support design and construction shall be sufficiently robust to accommodate varying field conditions such as utilities.

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- B. Soldier piles shall be installed by driving or by setting piles in predrilled excavations. When piles will be placed within two feet of utilities, a steel casing shall be installed to a level of at least six inches below the bottom of the utility prior to excavation.

3.2 SOLDIER PILES

- A. The shaft excavation for each soldier pile shall extend to the design tip elevation.
- B. Drilling Methods. Drilling for soldier pile installation shall be according to Section 31 63 29, Drilled Concrete Piers and Shafts. No shaft excavation shall be made adjacent to a soldier pile with encasement concrete that has a compressive strength less than 1500 psi, nor adjacent to secant lagging until the CLSM has reach sufficient strength to maintain its position and shape unless otherwise approved by the CGE.. Materials removed or generated from the shaft excavations shall be disposed of by the Contractor according to project specifications. Excavation by blasting will not be permitted.
- C. Drilling Slurry. During construction, the level of the slurry shall be maintained at a height sufficient to prevent caving of the hole. In the event of a sudden or significant loss of slurry to the hole, the construction of that shaft shall be stopped and the shaft excavation backfilled or supported by temporary casing until a method to stop slurry loss, or an alternate construction procedure, has been developed and approved by the CGE..
- D. Obstructions. Obstructions shall be defined as any object (such as but not limited to, boulders, logs, old foundations, etc.) that cannot be removed with normal earth drilling procedures, but requires special augers, tooling, core barrels or rock augers to remove the obstruction. When obstructions are encountered, the Contractor shall notify the CGE and Contracting Officer and upon concurrence of the CGE and Contracting Officer, the Contractor shall begin working to core, break up, push aside, or remove the obstruction. Lost tools or equipment in the excavation, as a result of the Contractor's operation, shall not be defined as obstructions and shall be removed at the Contractor's expense.
- E. Top of Rock. The top of rock will be considered as the point where rock, defined as bedded deposits and conglomerate deposits exhibiting the physical characteristics and difficulty of rock removal as determined by the CGE, is encountered which cannot be drilled with earth augers and/or underreaming tools configured to be effective in the soils indicated in the contractor's geotechnical investigations, and requires the use of special rock augers, core barrels, air tools, blasting, or other methods of hand excavation.
- F. Design Modifications. If the top of rock elevation requires an increase by more than 10 percent, the CGE shall be contacted to determine if any soldier pile design changes are required. In addition, if the type of soil or rock encountered is not similar to that shown in the Contractor's geotechnical investigations , the CGE shall be contacted to determine if revisions are necessary.
- G. The soldier pile shall be shop fabricated such that no field welding is required. The Contractor shall attach suitable bracing or support to maintain the position of the soldier pile within the shaft excavation such that the final location will satisfy the Construction Tolerances portion of this Special Provision. The bracing or supports shall remain in place until the concrete for encasement has reached a minimum compressive strength of 1500 psi.
- H. Modification to the length of a soldier pile may be required to satisfy the required embedment. The modification shall be made to the top of the soldier pile unless otherwise approved by the

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CGE. When the top of rock encountered is above the estimated elevation, the soldier piles shall be cut to the required length. If the top of rock encountered is below that estimated, the Contractor shall either furnish longer soldier piles or splice on additional length of soldier pile to satisfy the required embedment in rock. In order to avoid delays, the Contractor may have additional soldier pile sections fabricated as necessary to make the required adjustments.

- I. Concrete Placement. Concrete work shall be performed according to Section 31 63 29, Drilled Concrete Piers and Shafts, and as specified herein. The soldier pile encasement concrete pour shall be made in a continuous manner from the bottom of the shaft excavation. Concrete shall be placed as soon as possible after the excavation is completed and the soldier pile is secured in the proper position. Uneven levels of concrete placed in front, behind, and on the sides of the soldier pile shall be minimized to avoid soldier pile movement, and to ensure complete encasement.
- J. Following the soldier pile encasement concrete pour, the remaining portion of the shaft excavation shall be backfilled with CLSM.

3.3 LAGGING

- A. CLSM secant lagging placement shall be placed as soon as practical after the shaft excavation is cleared in general accordance with Section 31 63 29, Drilled Concrete Piers and Shafts.
- B. Timber lagging shall be placed from the top down as the excavation proceeds. Lagging shown above grade shall be installed and backfilled against prior to installing any permanent facing to minimize post construction deflections. Over-excavation required to place the timber lagging behind the flanges of the soldier piles shall be the minimum necessary to install the lagging. Any voids produced behind the lagging shall be filled with porous granular embankment.
- C. The Contractor shall be responsible for the successful performance of the lagging system until the concrete facing is installed.

3.4 DRAINAGE

- A. For walls with concrete fascia panels, a 4-foot-wide strip of prefabricated drainage mat shall be installed full height of the concrete fascia panel, centered between soldier pile flanges. The prefabricated drainage mat shall be attached to the lagging in accordance with the manufacturer's recommendations.
- B. The fabric side shall face the lagging. Splicing of the prefabricated drainage mat shall be in accordance with the manufacturer's recommendations. The Contractor shall ensure the hydraulic connection of the prefabricated drainage mat to the previously installed material so that the vertical flow of water is not impeded.
- C. The Contractor shall tape all joints in the prefabricated drainage mat to prevent concrete intrusion during concrete fascia panel construction.
- D. Connection pipes shall be lengths of solid PVC pipe installed to direct water from the geocomposite drain strips into the footing drain. Connection pipes and weepholes shall be connected to the drain strips by installing prefabricated drain grates in accordance with the drain strip manufacturer's recommendations. The joint between the drain grate and the drain strip and the discharge end of the connector pipe shall be sealed to prevent concrete intrusion. Damage of the geocomposite drain strip which may cause interruption in flow shall require installation of

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additional connection pipes or weepholes above the damaged section. Connection pipes shall be extended to the edge of the footing drain but not through the drainage geotextile. The integrity of the drainage geotextile shall not be interrupted.

- E. Footing drains shall consist of drainage aggregate and perforated PVC pipe enveloped in drainage geotextile and shall be constructed at the bottom of each wall. The drainage geotextile shall envelope the footing drain aggregate and pipe and shall conform to the dimensions of the trench. The drainage geotextile shall be overlapped on top of the drainage aggregate. Damaged or defective drainage geotextile shall be rejected by the CGE.

3.5 INSTALLATION TOLERANCES

- A. Construction Tolerances. The soldier piles shall be drilled and located within the excavation to satisfy the following tolerances:
 - 1. The center of the soldier pile shall be within 1-1/2 inches of plan station laterally and 1/2 - inch offset perpendicular to the wall at the top of the shaft.
 - 2. The out of vertical plumbness of the soldier pile shall not exceed 1 percent.
 - 3. The top of the soldier pile shall be within 1 inch of the plan elevation.
- B. Notwithstanding other tolerances specified herein, the inside surface of the excavation support wall shall not encroach upon the minimum clearances needed for the construction of the permanent structures.

END OF SECTION

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SECTION 31 74 10

JACKED BOX CONSTRUCTION

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Permanent concrete box.
- B. Temporary works design for excavation and jacking station.
- C. Performance criteria for the potentially impacted Caltrans infrastructure.
- D. Specific protection requirements.

1.2 RELATED SECTIONS

- A. Section 03 20 00, Concrete Reinforcing.
- C. Section 03 30 00, Cast-in-Place Concrete.
- D. Section 31 09 13, Geotechnical Instrumentation and Monitoring.

1.3 SUBMITTALS

- A. Concrete Mix Design and Reinforcement: Provide submittals of the permanent concrete box in accordance with the requirements of Section 03 20 00, Concrete Reinforcing, and Section 03 30 00, Cast-in-Place Concrete
- B. Box Jacking Systems: Obtain Contractor's geotechnical engineer's review and approval and Contracting Officer's acceptance of the following submittals. Obtain Caltrans approval as required under the agreement between Caltrans and the Authority.
 - 1. Submit procedure, including outline of excavation system and layout of jacking station.
 - 2. Submit construction sequence procedures, including plans, instrumentation and monitoring of ground and any existing infrastructure in the area of influence, definition of allowable ground movements, control measures and implementation plan for the existing infrastructure.
 - 3. Submit detailed design of the temporary works associated with the jacking of the box. Include design calculations to support the shop drawings and other submittals specified herein for the jacked box.
 - 4. Submit calculations of the expected vertical and lateral ground movements imparted by the jacking operations and all works associated with the jacking. The report shall also include structural assessment and serviceability assessment of the highway and the bridge affected by the jacking works.
 - 5. Submit an assessment of the bridge which shall include maximum theoretical displacements and rotations of the bridge abutment at foundation and deck support level.

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- D. Professional Engineer's Certification: excavation system, specifications, shop drawings, calculations shall be prepared, sealed, and signed by a professional civil or structural engineer currently registered in the State of California.
- E. Submit independent check calculations and related documents prepared, signed, and sealed by an independent civil or structural engineer currently registered in the State of California for all submittals required herein. The check documents shall confirm the essential elements of the design and shall be prepared in accordance with the applicable Caltrans Manual.
- F. The Contractor shall submit relevant examples of similar construction work showing required experience and capability performed within the last 5 years.

1.4 QUALITY ASSURANCE

- A. The engineer preparing drawings and design calculations for the jacking system shall be experienced in the design and construction of jacked boxes.
- B. Design of the jacked box, jacking system, and temporary works associated with jacked box shall be performed by an entity specializing in design and installation of similar work, including ground pre-treatment, shield design, and anti-drag system. This entity shall have relevant experience and be able to submit examples of similar construction work performed within the last five years.

PART 2 - PRODUCTS**2.1 CRITERIA**

- A. Design the jacked box to preserve or improve the performance of the existing ground into which it will be installed with reference to the conditions of the site prior to the construction works.
- B. Employ construction techniques to protect workers, protect the Work, minimize ground movement and prevent damage to adjacent structures, utilities and other facilities.
- C. Provide detailed Pre-construction and Post-construction structural, photographic and geometrical survey of all affected structures and facilities.
- D. If movements of the affected Caltrans bridge are shown to be within the limits included in the applicable Caltrans Manual, no structural assessment and mitigation measures need to be employed. The limits are reported below:
 - 1. Abutment Vertical Settlement = 0.5"
 - 2. Abutment Horizontal Movement = 0.25"
 - 3. Deck Vertical Movement (Continuous spans) = up to 1"
 - 4. Deck Vertical Movement (Simple Spans) = 1" to 2"
 - 5. Rotation = Refer to relevant Caltrans manual
- E. If movements of the affected Caltrans viaduct are shown to be above these reported limits, a structural assessment of the bridge and associated details shall be performed. Should this assessment indicate that the bridge is unable to tolerate the expected movements, the contractor

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shall include works to isolate the bridge from these movements and to restore it to its current functionality on completion of the Work.

- F. The design movements shall be calculated prior to any construction operation.
- G. The primary means of settlement mitigation to the Caltrans structures shall be practical measures to control ground movement by good design and construction practice. This could include ground treatment and face stabilization. In the event that physical mitigation measures are still required, these measure shall be reviewed and approved by Caltrans.
- H. Baseline readings shall be carried out in accordance with the requirements set by Section 31 09 13, Geotechnical Instrumentation and Monitoring, and approved by Caltrans.
- I. Design a ground measurement monitoring system compatible with the proposed method of construction. This should be supplemented with a monitoring and instrumentation plan which includes data collection frequency, alert and trigger levels and corresponding response measures.
- J. Install all monitoring instrumentation and collect readings from instrumentation. The system shall provide early information to permit timely implementation of any remedial measures.
- K. The Contractor shall define interim trigger levels associated with interim stages of the construction works. The Contractor shall implement an Emergency Preparedness Plan with corrective measures if these trigger levels be reached.
- L. The Contractor shall prepare an “Emergency Preparedness Plan” to cover the following as a minimum:
 - 1. Actions permitted within each trigger level;
 - 2. Emergency contacts and information to be provided to each;
 - 3. Actions to be taken immediately should a trigger level be exceeded;
 - 4. Actions to be implemented within defined time periods after exceedence of a trigger level;
 - 5. A traffic management scheme shall be developed that will be implemented in the event the construction works lead to the exceedence of a predefined emergency trigger level. The traffic management scheme shall be defined in accordance with the Contract requirements.
- M. Monitoring frequencies shall be defined in accordance to Section 31 09 13, Geotechnical Instrumentation and Monitoring, in Article entitled “Monitoring Schedule”, under Paragraphs.”General” and “Tunnel Excavation Monitoring”. In addition to these requirements, weekly readings after completion of jacking operations shall be carried out for at least 3 months and thereafter until all movements have ceased.

2.2 JACKING OPERATIONS

- A. The design of jacking operations and the associated specification shall, at minimum, account for the following elements, as applicable:
 - 1. Soil and groundwater conditions.
 - 2. Additional ground investigations.
 - 3. Shield design.

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4. Risks of soil dragging and proposed mitigation measures.
5. Face stability.
6. Ground treatment strategy.
7. Design of the jacking system and back up requirements to ensure reliability and fault tolerance.
8. Size, foundation type, and proximity of adjacent structures.
9. Settlements of adjacent structures.
10. Utilities crossing the excavation or adjacent to the excavation.
11. Traffic and construction equipment surcharge adjacent to the excavation.
12. Noise and vibration restrictions.
13. Instrumentation and monitoring.
14. Spoil handling and treatment.

PART 3 - EXECUTION

Not Used

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CALIFORNIA HIGH-SPEED TRAIN PROJECT – SPECIAL SPECIFICATIONS**Agreement No: HSR13-06****SECTION 33 40 00****STORM DRAINAGE UTILITIES**

The provisions of CHSTP Standard Specifications Section 33 40 00, Storm Drainage Utilities, shall apply to the Work as modified herein.

PART 1 - GENERAL**1.3 REFERENCE STANDARDS:** Add the following:

- D. Fresno Metropolitan Flood Control District (FMFCD)
 - 1. Standard Plans and Specifications
 - 2. Detention Basin Design Criteria

1.4 SUBMITTALS: Add the following:

- C. Provide submittals to the Fresno Metropolitan Flood Control District (FMFCD) for all modifications to its existing storm water system such as drainage plans and hydraulic calculations.

PART 2 – PRODUCTS: Add the following new Article:**2.5 CRITERIA**

- A. If the provisions of the agreement between the FMFCD and the Authority differ from the requirements specified herein, the agreement shall govern.
- B. Rail and Roadway Storm Drainage
 - 1. Between Herndon Avenue and East American Avenue in Fresno the Authority right-of-way and roadway realignments may discharge storm water to the FMFCD storm drain system at the 2-year storm event flow rate as defined by the FMFCD.
 - 2. Within the Authority rail alignment, storm events that exceed the 2-year storm event flow rate may be stored within the Authority right-of-way until they can be discharged to the FMFCD storm drain system at the 2-year rate in accordance with FMFCD standard practice for areas in Fresno that fall within its jurisdiction.
 - 3. For road realignments within areas that fall within the FMFCD drainage remit, storm events that exceed the 2-year storm event flow rate may be stored within the realigned and/or existing roadway until they can be discharged to the FMFCD at the 2-year rate.
 - 4. Pre-treatment of post-construction storm water is not required prior to discharging to the FMFCD storm drain system.
 - 5. Points of connection to the FMFCD storm drain system shall meet the FMFCD Standard Plans and Standard Specifications.
 - 6. New detention basins may be constructed within the Authority ROW to manage storm water originating from the Authority rail alignment.
 - 7. Areas outside the FMFCD remit shall be designed to meet the “Post-Construction Standards” specified in Section XIII of the National Pollution Discharge Elimination

STORM DRAINAGE UTILITIES

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Permit System (NPDES) General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities, Order No. 2009-009-DWQ or coordinated with an agency that has an existing Municipal Separate Storm Sewer System (MS4) permit, as applicable.

END OF SECTION**07/12/2013 Agreement No. : HSR13-06 EXECUTION VERSION****STORM DRAINAGE UTILITIES**

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SECTION 35 40 00

WATERWAY CONSTRUCTION AND EQUIPMENT

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Design requirements for waterway modifications including irrigation canals.

1.2 RELATED SECTIONS

- A. Section 03 30 01, Design and Construction of Trench Structures.

1.3 REFERENCE STANDARDS

- A. Fresno Irrigation District (FID):
 - 1. Standard Plans and Specifications.

1.4 SUBMITTALS

- A. Provide submittals to the Fresno Irrigation District (FID) of for all FID waterway modifications such as structural drawings, calculations, and hydraulic models.

PART 2 - PRODUCTS

2.1 CRITERIA

- A. Design and submittal of design for waterway modifications shall take into account the time period required by FID for its review and approval process.
- B. Waterway modifications shall:
 - 1. Take place outside approved flood and irrigation seasonal periods per FID requirements.
 - 2. Maintain or improve the existing hydraulic conditions.
 - 3. Minimize the potential for the waterway becoming blocked.
 - 4. Maintain FID maintenance access and provide new access, as necessary, for canal realignments..
 - 5. Provide board guides on the upstream and downstream sides of all culverts for maintenance purposes per FID standards.
 - 6. Match canal lining requirements per FID standards.
 - 7. Be approved by FID.

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WATERWAY CONSTRUCTION AND EQUIPMENT

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CALIFORNIA HIGH-SPEED TRAIN PROJECT – SPECIAL SPECIFICATIONS**Agreement No: HSR13-06****PART 3 - EXECUTION****3.1 COORDINATION WITH FRESNO IRRIGATION DISTRICT (FID)**

- A. Coordinate the waterway structure construction schedule with the requirements of FID. The FID irrigation season usually extends from March to August, with peak irrigation flows occurring between May and July. However, the end of the irrigation season is dependent on rainfall, and the latest recorded irrigation season extended to November. Work in canals is generally carried out between the irrigation and flood seasons, between November and December.
- B. Coordinate the construction of the waterway structures in the areas of Herndon Canal, Dry Creek, Fresno Colony Canal, Central Canal, and Viau Canal with the requirements of FID and Fresno Metropolitan Flood Control District (FMFCD) authorities to ensure that there is adequate provision for dealing with the risk of flooding at all times.

3.2 SERVICEABILITY

- A. The Contractor shall be able to bypass flows up to 600 cubic feet per second (cfs) in Herndon Canal per FID requirements.
- B. The Contractor shall be able to bypass flows of up to 500 cubic feet per second (cfs) in Dry Creek Canal per FID requirements
- C. The Contractor shall be able to bypass flows of up to 50 cubic feet per second (cfs) in Fresno Colony Canal per FID requirements.
- D. The Contractor shall be able to bypass flows of up to 350 cubic feet per second (cfs) in Central Canal per FID requirements.
- E. The Contractor shall be able to bypass flows of up to 9 cubic feet per second (cfs) in Viau Canal per FID requirements.”

END OF SECTION

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